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Data Paper

Fungal literature records database of the Northern West Siberia (Russia)

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Abstract

Background

Mycological research in the Northern part of West Siberia has now become sufficient for review and digitisation as over 460 scientific works have been completed mainly since the beginning of the 20th century. The history of research in the region started from isolated studies at the beginning of the 20th century, but regular and systematic research started from the 1970s. Over the following decades, several dozens of researchers have worked in the area, but the reported occurrences were scattered amongst a broad variety of publications, mainly hardly available. The great need in digitisation and accumulation of fungal records reported in published literature in a standardised regional database has now become evident. The «Fungal records database of the Northern West Siberia» (FuNWS)

was initiated in 2016 according to contemporary biodiversity data standards (Darwin Core), to be compatible and accessible by the broad research community. The database has been supplemented ever since by the collective effort of specialists working in the area. According to the database summary report, there are 3358 fungal and fungus-like species revealed in the Northern West Siberia at present. The richest in species number classes are Agaricomycetes (60%) and Lecanoromycetes (33%) with a total of 25 classes represented. The FuNWS database was uploaded to Global Biodiversity Information Facility (GBIF) (Ygra State University Biological Collection publisher) on 11 November 2017 (earlier titled «Fungal Records Database of Yugra, FReDY») to provide open access to the data and its reusability (Filippova et al. 2020).

New information

This publication summarises the results of the digitisation of literature-based occurrence records of fungi and fungus-like organisms initiated in the Northern part of West Siberia for the first time in the history of mycological research. The bibliography of regional mycological publications was created to include about 460 published works (Suppl. material 2). In total, about 140 literature sources were digitised and about 22000 occurrence records were integrated into the FuNWS database (Filippova et al. 2020).

Keywords

occurrence, specimen, funga, Mycobiota, digitisation, data mobilisation

Introduction

The mycological research in the Northern part of West Siberia stems from isolated studies in the beginning of the 20th century, yet regular and systematic research only began in the second half of the century. Over the following decades, several dozen researchers worked in the area and a total of over 460 scientific works were published. The history of mycological research in the southern half of this area was described in two publications (Filippova et al. 2017b, Filippova et al. 2017a). The history of research of particular groups of fungi was reviewed in corresponding monographs and regional checklists (Magomedova and Ektova 2006, Magomedova et al. 2006, Mukhin 1993, Karatygin et al. 1999). The common checklist of fungi for the total area of the Northern West Siberia does not yet exist and the species occurrences were scattered amongst a broad variety of publications, mainly hardly available. The biodiversity data digitisation and mobilisation programme started in the region recently, bringing the standard approach to biodiversity data storage and their integration into common portals. In line with this programme, we carried out digitisation of literature-based occurrences of fungi reported in the region. A database of occurrence records was created to accumulate those extracted from literature records, which could be considered as a substitute for printed checklists or funga of older times.

The database was initiated in 2016 using Google Sheets (a web-based service, https://www.google.com/sheets/about/) as a table formatted in accordance with the Darwin Core standards (Filippova and Bolshakov 2017). The species occurrence records were filled in by the collective effort of specialists working in the area. The first published version of the database was dedicated solely to the Khanty-Mansi Autonomous Okrug – Yugra in its administrative borders (Filippova and Bulyonkova 2018). Additional literature was added later to cover the whole Northern West Siberia (including two administrative regions: Yugra and Yamalo-Nenets Autonomous Okrug) and the database was re-named accordingly (Filippova et al. 2020).

According to the database summary report, there are about 3358 species identified in the region to date. Amongst 25 classes represented in the data, the richest are Agaricomycetes (60%) and Lecanoromycetes (30%).

Below we describe the history of mycological research in the Northern part of West Siberia in each administrative region by traditionally-studied morphological or ecological groups.

Overview of the mycological research reflected in the database

Yamalo-Nenets Autonomous Okrug

About 25 researchers participated in the inventory of **lichens** in the region. The most complete species lists were published in a series of works (Andreev 1982, Andreev 1984, Ahmet'ev et al. 1993, Magomedova and Ektova 2006, Magomedova et al. 2006, Pristyazhnyuk 1994, Pristyazhnyuk 1996, Pristyazhnyuk 1998, Pristyazhnyuk 2001, Ryabkova 1998, Sedelnikova 2017, Zhurbenko 1999). The history of the inventory of lichens in the region was described in detail for the Urals in Ryabkova (1965), for the Yamal Peninsula in Magomedova and Ektova (2006) and for the Polar Urals in Magomedova et al. (2006). In the first half of the 20th century, studies of reindeer husbandry and productivity of lichens were initiated by K. N. Igoshina in a series of works Igoshina (1933), Igoshina (1935), Igoshina (1937), Igoshina (1939), Igoshina and Frolovskaya (1939). The assessment of natural factors, as well as grazing and pyrogenic factors on lichens productivity, was continued later in the Polar Urals in a series of publications (Abdulmanova and Ektova 2015b, Abdulmanova and Ektova 2015a, Abdulmanova and Ektova 2013, Ektova and Morozova 2015).

Agaricoid basidiomycetes is a less-studied group in the Yamalo-Nenets Autonomous Okrug compared to the bordering southern region. Sporadic studies were conducted in the Polar Urals by Kazantseva (1966), Kazantseva (1968b), Kazantseva (1970), Knudsen and Mukhin (1998), in the Southern Yamal by Tarchevskaya (1985a), Tarchevskaya (1985b), Tarchevskaya (1986), Tarchevskaya (1990) and in the Tazovskiy peninsula by Kapitonov (2015). Regular inventories and herbarium collections were conducted at several field stations of the Komarov Botanical Institute of the Russian Academy of Sciences working in the region in the second half of the 20th century (Karatygin et al. 1999). The collections made during this period are stored in the LE herbarium (Saint-Petersburg) and later

processed in a series of publications (Kovalenko 1999, Malysheva 2018, Nezdoiminogo 1996, Nezdojminogo 2001).

Clavarioid basidiomycetes are a well-studied group mainly by a single researcher working in different regions: the Polar Urals (Shiryaev 2006), Novaya Zemlya, Yamal, Beliy island and Gydana (Shiryaev 2011) and in the Middle Urals (Shiryaev 2004). The geographical distribution of the clavarioid fungi was analysed in a number of works (Shiryaev 2013, Shiryaev et al. 2016, Shiryaev 2017, Shiryaev 2018). The impact of climate change on the clavarioid fungi is hypothesised in several papers (Shiryaev 2009, Shiryaev et al. 2019).

Lignicolous basidiomycetes are a well-studied ecological group in the North of West Siberia. N. T. Stepanova-Kartavenko initiated the inventory of the middle Urals (Stepanova-Kartavenko 1967) and made some works in the Polar Urals (Stepanova and Sirko 1970). L. K. Kazantseva dedicated the study of wood-decay mycobiota to the northern regions of the Polar Urals and Yamal (Kazantseva 1971a, Kazantseva 1971b, Kazantseva 1972). V. A. Mukhin analysed the biogeography and ecology of lignicolous basidiomycetes in West Siberia, from the forest-steppe zone in the South to the tundra-steppe in the North (Mukhin 1984, Mukhin 1987a). The same author examined the local mycobiotas in several publications (Mukhin and Stepanova 1982, Mukhin and Stepanova 1983, Mukhin 1983, Mukhin 1987b, Mukhin 1991, Mukhin and Olshvang 1983). S. P. Arefyev studied lignicolous communities on imported wood in the Yamal Peninsula (Arefyev 2002) and made a revision of the lignicolous community in the Verzhne-Tazovskiy Nature Reserve (Arefyev 2004). He also initiated important research of lignicolous communities and their transformation in the urban centres of the North (Arefyev 1996, Arefyev 1998).

A number of works was performed to study **fungal pathogens** of plants in the region, by Demidova (1962), Demidova (1970), Kazantseva (1968a) and Stepanova (1970). Some records of pathogens of cereals are reported in the monograph by Lavrov (1951) on the mycoflora of cereals of Siberia. A series of inventories performed at the former field stations of the Komarov Botanical Institute (collections stored in LE) were summarised in Karatygin et al. (1999).

Myxomycetes of the Urals, including its northern territories, are described in the PhD thesis by Fefelov (2006) and collections stored in LE are summarised in Karatygin et al. (1999).

Soil microfungi were studied in a few works (Kulay 1968, Kulay and Ischenko 1974), as well as in the PhD thesis by Ischenko (1981).

The occurrence records of **discomycetes and other ascomycetes** appeared in the papers by A. V. Raitvir with co-authors (Raytviyr and Sirko 1968, Sirko 1970a, Sirko 1970b, Sirko 1971, Kazantseva and Sirko 1974), with collections stored in LE being summarised in Karatygin et al. (1999).

Additionally, B. V. Krasutsky was deeply engaged in the ecological study of **fungivorous Coleoptera** communities (Krasutskiy 2007), inventorying several localities in the region.

Khanty-Mansi Autonomous Okrug

Lignicolous basidiomycetes have been studied quite extensively by a number of researchers. S. P. Arefyev initiated regional studies on wood-pathogens (Arefyev 1990, Arefyev 1991) and applied ecological modelling of lignicolous communities (Arefyev 2003, Arefyev 2008b, Arefyev 2010). Along with these approaches, the same author inventoried several regions and protected areas (Arefyev 2003, Arefyev 2008a, Arefyev 2011, Arefyev 2013). V. A. Mukhin (1993) analysed the lignicolous communities along a latitudinal gradient in Western Siberia in a comprehensive monograph. I. V. Stavishenko contributed greatly to the knowledge of species diversity in the regional conservation areas (Stavishenko 2000, Stavishenko 2003, Stavishenko 2007a, Stavishenko 2007b, Stavishenko 2011, Stavishenko and Mukhin 2002, Stavishenko and Zalesov 2008). Some recommendations on monitoring of lignicolous fungi in protected areas (Stavishenko 1996, Stavishenko 1997, Stavishenko 2008) and in oil and gas production areas (Stavishenko and Zalesov 2008) were developed.

The inventories of **lichens** were performed in a number of protected areas in the region, with the highest number of species revealed in the Polar Urals and adjacent areas (Paukov and Mikhaylova 2011, Ryabkova et al. 1996, Sedelnikova and Taran 2000, Sedelnikova 2010, Tolpysheva and Shishkonakova 2019, Trapeznikova 2003, Shalatonov 2010, Chabanenko and Taran 2004). Attention was paid to the restoration processes of lichen cover in disturbed areas (Shishkonakova and Tolpysheva 2018, Tolpysheva and Shishkonakova 2020, Shishkonakova et al. 2013) and under natural regression of peatlands (Shishkonakova et al. 2016). Several papers were devoted to the lichens of raised bogs, covering large areas in the region (Lapshina and Koneva 2010, Tolpysheva 2004).

Marcofungi were studied in a number of areas, but the most thoroughly studied area were centred around Khanty-Mansiysk and, in the south-east part, in and near the Yuganskiy Nature Reserve. The Nature Reserve has been inventoried since 2007 in a number of studies (Zvyagina et al. 2009, Zvyagina, E.A. and Baykalova, A.S. 2017, Zvyagina et al. 2007, Zvyagina 2012, Zvyagina 2015). In the Khanty-Mansiysk vicinity, the inventory was targeting particular communities of peatlands and forests (Filippova and Thormann 2014, Filippova and Bulyonkova 2017, Filippova et al. 2015). The permanent plot-based monitoring of macromycetes fruiting dynamics has been initiated since 2014 in different vegetation types (Filippova et al. 2014, Filippova and Bulyonkova 2017). Some other protected areas of Yugra were visited by other researchers and the checklists were published (Zvyagina and Vasina 2015, Kapitonov 2012, Makarova et al. 2015, Shiryaev 2002).

The study of the diversity of **myxomycetes** was carried out in two protected areas (Fefelov 2002, Fefelov 2007). The community of corticolous myxomycetes was sampled nearby Khanty-Mansiysk with the description of two new species (Vlasenko et al. 2019, Vlasenko et al. 2018).

Phytopathological studies are developing in the city of Surgut. The flora of **fungal pathogens** of the city parks of Surgut was studied for many years by T. A. Marakova and colleagues (Makarova et al. 2011, Makarova and Makarov 2016).

The communities of **microfungi** and yeasts were sampled in a study of mycobiota of raised bogs (Filippova 2012, Filippova 2015, Filippova and Thormann 2015, Kachalkin 2010). Some works were devoted to the study of the influence of lichens on soil micromycetes (Tolpysheva 2006).

General description

Purpose: This is the first example of digitisation of species occurrence data published in literature in the Northern part of West Siberia and its publication as a GBIF dataset. The paper also provides the contemporary analysis of the research state of the funga in the region. The aim of the data paper was to provide the description and the link to the published dataset in the format of a peer-reviewed journal paper and to provide recognition for the effort by means of a scholarly article (based on Data paper definition published at https://www.gbif.org/en/data-papers).

Project description

Title: Biodiversity data digitisation and mobilisation in Northern West Siberia (https://nwsbios.org)

Personnel: Nina Filippova

Sampling methods

Study extent: The digitisation was aimed at summarising the species occurrences of fungi and fungi-related organisms accumulated in the course of previous mycological studies and published in peer-reviewed scientific literature. The geography extended to the Northern part of West Siberia, in the administrative borders of two regions (Yamalo-Nenets Autonomous Okrug and Khanty-Masi Autonomous Okrug-Yugra). Over 460 publications were reviewed and the species occurrence records were extracted from about 140 selected works. About 80% of species occurrences accumulated in the database were relatively recent, i.e. published in literature since the beginning of 21st century.

Sampling description: Methods of sampling vary in different reviewed publications, but generally follow the protocols of Mueller et al. (2004) for different taxonomical and ecological groups. The majority of the records were made using direct observation of fruiting structures. The exception are a few studies of micromycetes and yeasts where cultivation techniques were applied. No molecular (environmental sampling) methods were used until the present to reveal molecular diversity of fungi in the region. Plot-based monitoring of terrestrial and lignicolous macrofungi was organised by some researchers,

providing estimates of quantitative parameters and temporal dynamics of fungal communities. The majority of fungal occurrence records were accompanied by accessioning of specimens in fungaria, although the specimen numbers are rarely reported in publications. The specimens are stored in different collections within and outside the region where the researchers were working (i.e. the main collections of LE - the Komarov Botanical Institute, Saint-Petersburg; SVER - Institute of Ecology of Animals and Plants, Ekaterinburg; NSK - Central Siberian Botanical Garden, Novosibirsk and others).

Quality control: The original species identifications from the published works were recorded in the database, although no attempt was made for the revision of the species identification accuracy. A single author revised the species list and corrected wrong original identifications: the corrected names were added in identificationRemarks field, totalling 15 records in the database. The incorrect spelling of taxa was verified using the GBIF Species Matching tool at the later stage of the database compilation. Possible georeference errors at the scale of the region were corrected using QGIS software (https://qgis.org/en/site) by eliminating the outliers. Depending on the quality of georeferences provided in publications, the uncertainty was estimated as follows: 1) the coordinate of a fruiting structure or a plot provided in the publication gave the uncertainty about 3-10 m; 2) the coordinates of the fieldwork locality provided in publications gave the uncertainty to about 500 m – 5 km; 3) the report of the species presence in the district or the region gave the central coordinates of the area with the uncertainty radius to include its borders. The occurrences with large uncertainties were not eliminated, as they can still be important in the global context.

Step description:

1. The bibliography of related publications was compiled using Zotero bibliographic manager (https://www.zotero.org). Only published works (peer-reviewed papers, conference proceedings, PhD theses, monographs or book chapters) were selected.
2. The layout of the FuNWS database was made using Google Sheets software. Such database could be filled simultaneously by several specialists and a common data format will be provided (Filippova and Bolshakov 2017).
3. The Darwin Core standard was applied to the database structure to accommodate the relevant information extracted from the publications.
4. From the available bibliography of publications related to the region, only works with species occurrences were selected for the databasing purpose. We decided to include all different sorts of occurrence records, from a mere mention of the species within the administrative region, to the annotated species lists with exact locations of the records.
5. All occurrence records were georeferenced, either from the coordinates provided in the paper or from the verbal description of the fieldwork locality. The georeferencing of the verbal descriptions was made using Yandex (https://yandex.ru/maps) or Google (https://maps.google.ru/maps) maps services.
6. The coordinate uncertainty was estimated according to the algorithm described above (see Quality Control paragraph).

7. The locality names reported in Russian were translated into English and written in the «locality» field. Russian descriptions were reserved in the field «verbatimLocality» for accuracy.
8. When possible, the «eventDate» was extracted from the species records annotation data. Whenever this information was absent, the date of the publication was used instead.
9. The ecological features, habitat and substrates preferences were written in the «habitat» and reserved in Russian.
10. The original scientific names, reported in publications, were filled in the «originalNameUsage». Correction of the spelling errors was made using the GBIF Species Matching tool.
11. The GBIF Species matching tool was used to create the additional fields of taxonomic hierarchy from species to kingdom, to fill in the «taxonRank» field and to make synonymisation according to the GBIF backbone.
12. The taxonomic and spatial analyses of the final database were made using Microsoft Excel, QGIS and R software (https://www.r-project.org).
13. To track the digitisation process, a working database was created. Each bibliographic record has a series of fields to describe the digitisation process and its results: the total number of extracted occurrence records, general description of the occurrence quality, presence of observation date, presence of specimen number and details of georeferencing (Suppl. material 1).

Geographic coverage

Description: The dataset is limited by the administrative borders of two regions (Yamalo-Nenets Autonomous Okrug, Khanty-Masi Autonomous Okrug-Yugra). However, in cases where the digitised work contained records from other regions, they were also entered into the database (totalling about 1300 such records). The region occupies the central to Northern part of the West Siberian Plain. The area extends for about 1300 km from the West to the East, from the Eastern slopes of the Ural mountains to Yenisey river and from North to South – about 1600 km. The total area equals about 1,300,000 km^2.

The relief of the region is mainly a plain, but the western part of the area is occupied by the Ural mountains with the highest points reaching up to 2000 m. The three vegetation zones (taiga, forest-tundra and tundra) and well-developed peatland cover represent the plain, while the mountain vegetation of the Urals changes from taiga to alpine zones.

In the southern half of the area (Yugra region), most administrative divisions were covered by mycological research, but the intensity of the research varied. A total of 80% of all records in the database have been made from four districts (Khanty-Mansiyskiy, Surgutskiy, Berezovskiy, Sovetskiy). In total, about 13000 records or 60% come presently from the Yugra region.

The northern part of the region was represented by less numbers of records in the database (about 6000 or 27%). The research is mainly concentrated in two districts (Priuralskiy - 66% of records and Yamalskiy - 22%).

Generally, localities of the studies are situated randomly, with no attempts for regular studies using grid pattern having been made before. The areas under different kinds of nature protection are better studied compared to others: about half of all records in the database come from 13 protected areas (Fig. 1).

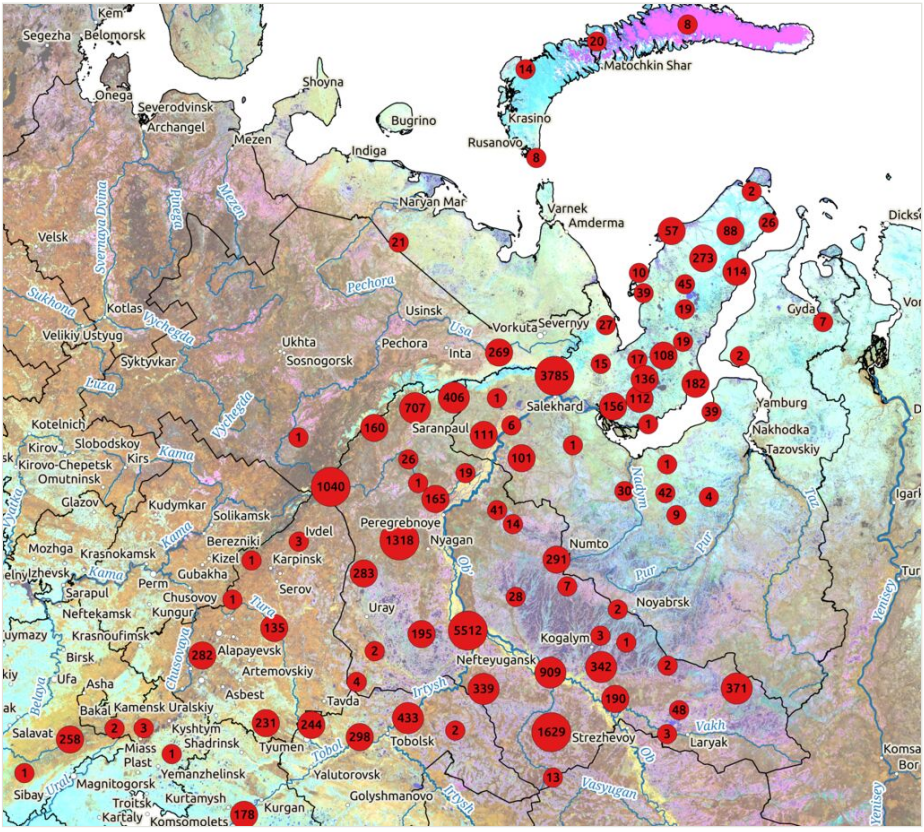

Figure 1. doi

The distribution of the occurrence records from the FuNWS on Landsat satellite image of the area. The clustering of points was made within a radius of 50 km; the scale breaks were selected manually after plotting the frequency distribution histogram.

Coordinates: 58.309 and 73.749 Latitude; 58.887 and 86.353 Longitude.

Taxonomic coverage

Description: According to the database summary report, there are about 3358 species revealed in Northern West Siberia to date, representing 1020 genera, 293 families, 94 orders, 25 classes, six phyla and two kingdoms (Fungi, Protozoa). The richest studied classes by number of occurrences are Agaricomycetes (60%) and Lecanoromycetes (30%). The richest ten families by number of species are Parmeliaceae (144 species), Russulaceae (111), Physciaceae (99), Cortinariaceae (96), Tricholomataceae (93), Polyporaceae (84), Lecanoraceae (83), Cladoniaceae (81), Hymenogastraceae (79) and Ramalinaceae (67 species).

Taxa included:

Rank	Scientific Name
kingdom	Fungi
kingdom	Protozoa

Temporal coverage

Notes: 1905-01-01 through 2020-01-01

Usage rights

Use license: Other

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Data resources

Data package title: Fungal literature records database of the Northern West Siberia (Russia)

Resource link: https://www.gbif.org/dataset/29e78377-34c3-4c91-8062-550069a92b70

Alternative identifiers: https://doi.org/10.15468/hfje3l; http://gbif.ru:8080/ipt/resource?r=fredy;

Number of data sets: 1

Data set name: Fungal literature records database of the Northern West Siberia (Russia)

Data format: Darwin Core

Description: The dataset includes a table in Darwin Core format with 28 fields and about 22000 records.

Column label	Column description
occurrenceID	https://dwc.tdwg.org/terms/#dwc:occurrenceID; an identifier of a particular occurrence, unique within this dataset. An abbreviation in the identifier' number (FReDY-xxxxxx) inherited from the previous name of the dataset (Fungal Records Database of Yugra).
bibliographicCitation	https://dwc.tdwg.org/terms/#dcterms:bibliographicCitation; the bibliographic citation of a publication from which the occurrence was extracted.
scientificName	https://dwc.tdwg.org/terms/#dwc:scientificName; the original names as provided in publication, but corrected for spelling mistakes using GBIF Species Matching tool.
verbatimLocality	https://dwc.tdwg.org/terms/#dwc:verbatimLocality; the original locality description of the collection place below county level, in Russian.
locality	https://dwc.tdwg.org/terms/#dwc:locality; the locality description translation in English.
habitat	https://dwc.tdwg.org/terms/#dwc:habitat; the description of habitat, including vegetation and substrate, in Russian or English.
fieldNumber	https://dwc.tdwg.org/terms/#dwc:fieldNumber; the herbarium or field specimen number, when reported in the source.
basisOfRecord	https://dwc.tdwg.org/terms/#dwc:basisOfRecord
year	https://dwc.tdwg.org/terms/#dwc:year; the year of observation/collection, if provided in publication. If no particular date were reported, the year of the publication itself was applied as the observation date.
month	https://dwc.tdwg.org/terms/#dwc:month; the month of observation/collection, if provided in publication.
day	https://dwc.tdwg.org/terms/#dwc:day; the day of observation/collection, if provided in publication.
countryCode	https://dwc.tdwg.org/terms/#dwc:countryCode
stateProvince	https://dwc.tdwg.org/terms/#dwc:stateProvince; the administrative unit below Country level (Okrug, Oblast, Respublica, Kray).
county	https://dwc.tdwg.org/terms/#dwc:county; the administrative unit below stateProvice level (Rayon).
decimalLatitude	https://dwc.tdwg.org/terms/#dwc:decimalLatitude
decimalLongitude	https://dwc.tdwg.org/terms/#dwc:decimalLongitude
coordinateUncertaintyInMeters	https://dwc.tdwg.org/terms/#dwc:coordinateUncertaintyInMeters; see "Quality control" chapter for the description of the uncertainty calculation algorithm.

geodeticDatum	https://dwc.tdwg.org/terms/#dwc:geodeticDatum
georeferenceSources	https://dwc.tdwg.org/terms/#dwc:georeferenceSources; the resource used to georeference the locality (Yandex maps, Google maps or georeferenced in publication).
taxonRank	https://dwc.tdwg.org/terms/#dwc:taxonRank; extracted from GBIF using Species Matching tool.
kingdom	https://dwc.tdwg.org/terms/#dwc:kingdom; extracted from GBIF using Species Matching tool.
eventDate	https://dwc.tdwg.org/terms/#dwc:eventDate; the full date of the observation event if provided in publication or the year of publication itself.
identificationRemarks	http://rs.tdwg.org/dwc/terms/identificationRemarks; comments or notes about the identification or missing taxa in GBIF backbone.
identificationQualifier	https://dwc.tdwg.org/terms/#dwc:identificationQualifier; a standard term ("cf.", "aff.") to express the determiner's doubts about the Identification.
language	https://dwc.tdwg.org/terms/#dcterms:language; languages used to describe the different fields of a record.

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Author contributions

Nina Filippova was the leader of the digitisation initiative and the main author of the paper. All authors participated in compilation of bibliography and revision of the species occurrences included in the database. All authors also participated in revision of the paper. I.V. Stavishenko revised part of the original identifications of the species and made updated identificationRemarks. E.A. Zvyagina verified original georeferences in Yuganskiy Nature Reserve, based on personal knowledge of the area.

References

- Abdulmanova SY, Ektova SN (2013) The growth ratio in height and biomass of fruticose lichens [Соотношение прироста по высоте и по биомассе у кустистых лишайников]. Izvestiya Samarskogo Nauchnogo Tsentra Rossiyskoy Akademii Nauk 15 (3-2): 688-691. [In Russian].
- Abdulmanova SY, Ektova SN (2015a) Growth processes of some species of fruticose lichens of the genus Cladonia (Cladoniaceae) in tundra communities [Ростовые процессы некоторых видов кустисто-разветвленных лишайников рода Cladonia (Cladoniaceae) в тундровых сообществах]. Rastitel'nyye Resursy 51 (3): 344-356. [In Russian].
- Abdulmanova SY, Ektova SN (2015b) Variations in the growth rate of Cladonia lichens during long-term post-fire successions in the North of West Siberia [Изменение скорости роста кустисто-разветвленных лишайников рода Cladonia в ходе пирогенных сукцессий на севере Западной Сибири]. Sibirskiy Ekologicheskiy Zhurnal 22 (3): 398-412. [In Russian]. https://doi.org/10.15372/SEJ20150307
- Ahmet'ev MA, Zagural'skaya LM, Stepanova AV (1993) Lichens of the Arctic tundra of the western coast of the Yamal Peninsula [Лишайники арктических тундр западного побережья полуострова Ямал]. Sporovyye Rasteniya Kraynego Severa Rossii: Tr. Komi NC UrO RAN. 125, 59. Syktyvkar, Syktyvkar, 59-71 pp. [In Russian].
- Andreev MP (1982) Lichens of the Arctic tundra of the upper reaches of the Tambey River (Yamal Peninsula) [Лишайники арктических тундр верховьев р. Тамбей (полуостров Ямал)]. Novosti Sistematiki Nizshikh Rasteniy 19: 111-116. [In Russian].
- Andreev MP (1984) Lichens of Yamal Peninsula [Лишайники полуострова Ямал]. Novosti Sistematiki Nizshikh Rasteniy 21: 127-136. [In Russian].
- Arefyev SP (1990) Rots of Siberian pine in the forests of middle taiga zone of the Irtysh river basin: PhD thesis [Гнилевые болезни сосны сибирской в лесах среднетаежного Прииртышья: автореф. дис. канд. биол. наук.]. Institut Ekologii Rasteniy i Zhivotnykh URO RAN, Sverdlovsk, 23 pp. [In Russian].
- Arefyev SP (1991) Xylotrophic fungi - the causal agents of siberian pine (Pinus sibirica du Tour) rot in the central taiga Irtysh river basin [Ксилотрофные грибы - возбудители гнилевых болезней кедра сибирского (Pinus sibirica du tour) в Среднетаежном Прииртышье]. Mikologiya i Fitopatologiya 25 (5): 419-425. [In Russian].
- Arefyev SP (1996) Biota of xylotrophic fungi of the impacted forests of Nadym city. International Symposium on Arcto-Alpine Mycology 11-12.
- Arefyev SP (1998) Communities of xylotrophic fungi in urban centres of the North of Western Siberia. Arctic and Alpine Mycology 5: Proc. of the Fifth Intern. Sympos. on Arcto-Alpine Mycology (Labytnangi, Russia, Aug. 15-27, 1996) 18-25.
- Arefyev SP (2002) Mycoflora of imported wood in the territory of gas condensate fields on the Yamal Peninsula [Микофлора привозной древесины на территории обустройства газоконденсатных месторождений полуострова Ямал]. Ekologiya Severnykh Territoriy Rossii. Problemy, Prognoz Situatsii, Puti Razvitiya, Resheniya: Mat-Ly Mezhdunar. Konf. 427-431. [In In Russian].
- Arefyev SP (2003) Investigation of flora and communities of wood-attacking fungi from Tarmansky forest-and-bog complex [Исследования флоры и сообществ

дереворазрушающих грибов Тарманского лесоболотного комплекса]. Vestnik Ekologii, Lesovedeniya i landshaftovedeniya 4[In Russian].

- Arefyev SP (2004) Ksilotrophic fungi of the Verkhniy Tazovsky Reserve [Дереворазрушающие грибы Верхне-Тазовского заповедника (бассейн р. Ратта)]. YANAO. Nauchnyy vestnik (Priroda Verkhne-Tazovskogo zapovednika) 38-51. [In In Russian].
- Arefyev SP (2008a) New records of rare fungi in Tyumen region [Новые находки редких грибов на территории Тюменской области]. IV Mezhdunarodnaya nauchno-prakticheskaya konferentsiya "AUS SIBIRIEN - 2008": Nauchno-Informatsionnyy sbornik 7. [In Russian].
- Arefyev SP (2008b) Nature complex of the «Numto» Natural Park: lignicolous fungi [Природный комплекс парка «Нумто»: Дереворазрушающие грибы]. Prirodnyy kompleks parka "Numto". Nauka, Novosibirsk, 112-126 pp. [In Russian].
- Arefyev SP (2010) Systemic analysis of lignicolous mycobiota [Системный анализ биоты дереворазрушающих грибов]. Nauka, Novosibirsk, 260 pp. [In Russian].
- Arefyev SP (2011) On mycoflora of the lower Irtysh basin [К микофлоре нижнего Прииртышья]. Vestnik Ekologii, Lesovedeniya i Landshaftovedeniya 12: 22-28. [In Russian].
- Arefyev SP (2013) Review of rare and protected species of Tyumen region [К ревизии списка редких и охраняемых грибов Тюменской области]. Materialy ko vtoromu izdaniyu Krasnoy knigi Tyumenskoy oblasti. TyumenNiigiprogaz, Tyumen, 3-16 pp. [In Russian].
- Chabanenko SI, Taran AA (2004) Lichens of the state reserve «Yugansky» and of the adjoining territories [Лишайники государственного природного заповедника «Юганский» и прилегающих территорий]. Biologicheskiye Recursy i Prirodopol'zovaniye: Sbornik Nauchnykh Trudov 7: 3-34. [In Russian].
- Demidova ZA (1962) To the flora of rust fungi in the Urals [К флоре ржавчинных грибов на Урале]. Materialy po Izucheniyu Flory i Rastitel'nosti Urala: Trudy Institiuta Biologii. UFAN SSSR, Sverdlovsk, 111-118 pp. [In Russian].
- Demidova ZA (1970) About smut fungi of the Urals [О головневых грибах Урала]. Sporovyye rasteniya Urala: Materialy po Izucheniyu Flory i Rastitel'nosti Urala. 4. UFAN SSSR, Sverdlovsk, 53-60 pp. [In Russian].
- Ektova SN, Morozova LM (2015) Rate of recovery of lichen-dominated tundra vegetation after overgrazing at the Yamal Peninsula. Czech Polar Reports 5 (1): 27-32. [In Russian]. https://doi.org/10.5817/CPR2015-1-3
- Fefelov KA (2002) Myxomycetes of the "Sibirskie Uvaly" natural park (West siberian Plain) [Миксомицеты заповедно-природного парка “Сибирские увалы”]. Ekologicheskiye issledovaniya vostochnoy chasti Sibirskikh Uvalov: Sb. Nauch. Tr. Zapovedno-prirodnogo Parka "Sibirskiye Uvaly". Nizhnevartovsk: Izd-vo "Priob'ye". 1: 93-103. [In Russian].
- Fefelov KA (2006) Myxomycetes (class Myxomycetes) of the Urals: taxonomic composition, ecology, geography: PhD thesis [Мискомицеты (класс Myxomycetes) Урала: таксономический состав, экология, география: автореф. дис. канд. биол. наук]. Botanicheskogo instituta imeni V.L. Komarova, Spb, 23 pp. [In Russian].
- Fefelov KA (2007) Myxomycetes of natural reserve "Malaya Sosva" [Миксомицеты заповедника “Малая Сосьва”]. Biologicheskiye Resursy i Prirodopol'zovaniye 10: 128-133. [In Russian].

- Filippova N, Bulyonkova T (2017) The communities of terrestrial macrofungi in different forest types in vicinities of Khanty-Mansiysk (middle taiga zone of West Siberia). Biodiversity Data Journal 5 https://doi.org/10.3897/BDJ.5.e20732
- Filippova N, Arefyev S, Bulyonkova T, Zvyagina E, Kapitonov V, Makarova T, Mukhin V, Stavishenko I, Tavshanzhi E, Shiryaev A (2017a) The history of mycological studies in Khanty-Mansi autonomous okrug: 2) studies of Macromycetes, Lichens and Myxomycetes, state of mycological collections and fungal records database. Environmental Dynamics and Global Climate Change 8 (2): 29-45. [In Russian]. https://doi.org/10.17816/edgcc8229-45
- Filippova N, Arefyev S, Bulyonkova T, Zvyagina E, Kapitonov V, Makarova T, Mukhin V, Stavishenko I, Tavshanzhi E, Shiryaev A (2017b) The history of mycological studies in Khanty-Mansi autonomous okrug: 1) the period of isolated studies, lignicolous basidiomycetes and phytopathological studies. Environmental Dynamics and Global Climate Change 8 (2): 18-28. [In Russian]. https://doi.org/10.17816/edgcc8218-28
- Filippova N, Bulyonkova T (2018) Fungal records database of Khanty-Mansi Autonomous Okrug – Yugra. BIO Web of Conferences 11 https://doi.org/10.1051/bioconf/20181100015
- Filippova N, Bulyonkova T, Zvyagina E, Kapitonov V, Makarova T, Mukhin V, Stavishenko I, Tavshanzhi E, Shiryaev A, Tolpysheva T, Sedelnikova N, Ryabitseva N, Paukov A, Zhurbenko M (2020) Fungal literature records database of the Northern West Siberia (Russia). Version 1.11. Yugra State University Biological Collection (YSU BC). Occurrence dataset https://doi.org/10.15468/hfje3l
- Filippova NV (2012) Discomycetes from plant, leave and sphagnum litter in ombrotrophic bog (West Siberia). Environmental Dynamics and Global Climate Change 3 (1): 1-20. https://doi.org/10.17816/edgcc311-20
- Filippova NV, Thormann MN (2014) Communities of larger fungi of ombrotrophic bogs in West Siberia. Mires and Peat 14: 1-22.
- Filippova NV, Mourgues A, Philippe F (2014) Notes on the phenology of fungi in ombrotrophic bog. Environmental Dynamics and Global Climate Change 5 (1): 1-14.
- Filippova NV (2015) On the communities of fungi of raised bogs in taiga belt of West Siberia. I. Microfungi on plant litter. Mikologiya i Fitopatologiya 49 (3): 164-172.
- Filippova NV, Thormann MN (2015) The fungal consortium of Andromeda polifolia in bog habitats. Mires and Peat 16 (6): 1-29.
- Filippova NV, Bulyonkova T, Lapshina ED (2015) Fleshy fungi forays in the vicinities of the YSU Mukhrino field station (Western Siberia). Environmental Dynamics and Global Climate Change 6: 3-31.
- Filippova NV, Bolshakov SY (2017) The history of mycological research and the regional literature records database in Khanty-Mansi Autonomous Okruk-Yugra. Bioraznoobraziye ekosistem kraynego severa: inventarizatsiya, monitoring, okhrana [Elektronnyy resurs]: III Vserossiyskaya nauchnaya konferentsiya: 20–24 noyabrya 2017 g., Syktyvkar, Respublik Komi. Izdatel'stvo IB Komi NTS UrO RAN, Syktyvkar, 126-129 pp.
- Igoshina KN (1933) Botanical and economic characteristics of reindeer pastures in the area of the Obdorsk station [Ботаническая и хозяйственная характеристика оленьих пастбищ в районе Обдорской зональной станции]. Sovremennoye Olenevodstvo 1: 165-211. [In Russian].

- Igoshina KN (1935) Reindeer pastures of the Polar Urals in the upper reaches of the Longotyugan and Shchuchya rivers [Оленьи пастбища Полярного Урала в верховьях рек Лонготюган и Щучьей]. Sovremennoye Olenevodstvo 5: 373-401. [In Russian].
- Igoshina KN (1937) Pasture feed and forage seasons in reindeer herding in the Urals [Пастбищные корма и кормовые сезоны в оленеводстве Приуралья]. Sovremennoye Olenevodstvo 10: 125-195. [In Russian].
- Igoshina KN (1939) Growth rate of the fodder reindeer moss in the Ural North [Рост кормовых ягелей на Приуральском севере]. Trudy instituta Polyarnogo zemledeliya, zhivotnovodstva i promyslovogo khozyaystva Ser. "Olenevodstvo" 5-27. [In Russian].
- Igoshina KN, Frolovskaya EF (1939) Pasture use and grazing in the Polar Urals [Использование пастбищ и выпас на Полярном Урале]. Trudy instituta Polyarnogo zemledeliya, zhivotnovodstva i promyslovogo khozyaystva Ser. "Olenevodstvo" 7-29. [In Russian].
- Ischenko NF (1981) Ecological and physiological characteristics of the microflora of some soils of the forest-tundra of the Trans-Urals [Эколого-физиологические особенности микрофлоры некоторых почв лесотундры Зауралья: автореф. дис. канд. биол. наук]. Institut Ekologii rasteniy i zhivotnykh, Sverdlovsk, 25 pp. [In Russian].
- Kachalkin AV (2010) Yeast communities of Sphagum bogs: PhD thesis [Дрожжевые сообщества сфагновых мхов : дисс. … канд. биол. наук]. Moscow State University, Moscow, 179 pp. [In Russian].
- Kapitonov VI (2012) Records of rare species of macromycetes in Uvatskiy district of Tyumen region [Находки редких видов макромицетов в Уватском районе Тюменской области]. 2. Chelovek i Sever: Antropologiya, arkheologiya, ekologiya: Materialy vserossiyskoy kontserentsii, g. Tyumen', 26-30 marta 2012 g. Izdatel'stvo IPOS SO RAN, Tyumen, 347 pp. [In Russian].
- Kapitonov VI (2015) Materials to mycobiota of the Taz Penincula [Yamal-Nenets Autonoous District) (Материалы к микобиоте Тазовского полуострова (Ямало-Ненецкий автономный округ]. In: Mukhin VA (Ed.) Bioraznoobraziye i ekologiya gribov i griboobraznykh organizmov severnoy Yevrazii: materialy Vseros. konf. s mezhdunarod. uchastiyem. Yekaterinburg, 20-24 aprelya 2015 g. Izdatel'stvo Ural'skogo universiteta, Ekaterinburg, 107-109 pp. [In Russian].
- Karatygin IV, Nezdoiminogo EL, Novozhilov YK, Zhurbenko MP (1999) Russian Arctic Fungi [Грибы Российской Арктики. Аннотированный список видов]. Izdatel'stvo SPb. Gos. Him.-Farmacevt. Akad., 212 pp. [In Russian]. [ISBN 5-8085-0058-3]
- Kazantseva LK (1966) To the mycoflora of the eastern slope of the Polar Urals [К микофлоре восточного склона Полярного Урала]. Zapiski Sverdlovskogo Otdeleniya Vsesoyuznogo Botanicheskogo Oshtestva 4: 162-166. [In Russian].
- Kazantseva LK (1968a) Notes to the smut and rust fungi of the Polar Urals [О головневых и ржавчинных грибах Полярного Урала]. Materialy otchetnoy sessii In-ta ekologii rasteniy i zhivotnykh Ural. fil. AN SSSR za 1967 god. 33-38. [In Russian].
- Kazantseva LK (1968b) On the seasonal development of higher fungi in the Polar Urals [О сезонном развитии высших грибов на Полярном Урале]. Materialy otchetnoy sessii Instituta ekologii rasteniy i zhivotnykh za 1967 g. Botanika. [In Russian].
- Kazantseva LK (1970) Agaric mushrooms collected in the Polar Urals [Арариковые грибы, собранные на Полярном Урале]. Ekologiya rasteniy i geobotanika: materialy otchetnoy sessii IERiZH za 1968 g. 68-7 pp. [In Russian].

- Kazantseva LK (1971a) The role of mushrooms in the decay of Siberian larch wood in the Polar Urals [Роль грибов в распаде древесины лиственницы сибирской на Полярном Урале]. Ekologia 96-98. [In Russian].
- Kazantseva LK (1971b) Mycoflora of the Polar Urals and its role in the initial stages of wood decay: PhD thesis [Микофлора Полярного Урала и ее роль в начальных стадиях распада древесины: автореф. дис. канд. биол наук]. Institut Ekologii rasteniy i zhivotnykh, Sverdlovsk, 32 pp. [In Russian].
- Kazantseva LK (1972) Role of fungi in the decomposition of wood and litter in the forest tundra zone [Роль грибов в разложении древесины и опада в зоне лесотундры]. Mikologiya i Fitopatologiya 6 (2): 115-116. [In Russian].
- Kazantseva LK, Sirko AV (1974) Ascomycetes as components of some plant communities in the Polar Urals [Сумчатые грибы как компоненты некоторых растительных сообществ Полярного Урала]. Biomassa i dinamika rastitel'nogo pokrova i zhivotnogo naseleniya v lesotundre. 88. UNTS AN SSSR, Sverdlovsk, 95-105 pp. [In Russian].
- Knudsen H, Mukhin VA (1998) The arctic-apline agaric element in the Polar Urals and Yamal, Western Siberia. Arctic and Alpine Mycology' 5: Proceedings of the Fifth International Symposium (Labytnangi, Russia, August 15-27, 1996) 152-162.
- Kovalenko AE (1999) The Arctic-Subarctic and Alpine-Subalpine component in the Hygrophoraceae of Russia. Kew Bulletin 54 (3): 695-704.
- Krasutskiy BV (2007) Mycetophilous beetles of the Urals and Trans-Urals. The system Lignicolous fungi – Insects [Мицетофильные жесткокрылые (Coleoptera, Insecta) Урала и Зауралья. Система Дереворазрушающие грибы - Насекомые: автореф. док. биол. наук]. Chelyabinsk [In Russian].
- Kulay GA (1968) Microbiological characteristics of some soils of the forest-tundra: field station Kharp [Микробиологическая характеристика некоторых почв лесотундры: участок МПБ Харп]. Materialy otchetnoy sessii Laboratorii lesovedeniya i pochvennoy mikrobiologii za 1967 god. [In Russian].
- Kulay GA, Ischenko NF (1974) Composition and dynamics of microflora of soils of forest-tundra [Состав и динамика микрофлоры почв лесотундры]. Biomassa i dinamika rastitel'nogo pokrova i zhivotnogo naseleniya v lesotundre. [In Russian].
- Lapshina ED, Koneva VA (2010) Species diversity of ground lichens in the raised bog vegetation of the Irtysh left-bank terraces [Видовое разнообразие напочвенных лишайников в растительном покрове верховых болот левобережных террас нижнего Иртыша]. Environmental Dynamics and Global Climate Change 1 (1): 1-6.
- Lavrov NN (1951) Fungi and myxomycetes of Siberia. V. 5. Pathogenic fungi of cereals [Флора грибов и слизевиков Сибири. Выпуск 5. Очерк микофлоры злаков Сибири]. Tomskiy gosudarstvennyy universitet, Tomsk. [In Russian].
- Magomedova MA, Ektova SN (2006) Lichens [Лишайники]. Poluostrov Yamal: Rastitel'nyy pokrov. [In Russian].
- Magomedova MA, Ectova SN, Ryabitseva NY (2006) Lichens [Лишайники]. Rastitel'nyy pokrov i rastitel'nyye resursy Polyarnogo Urala. [In Russian].
- Makarova MA, Makarov PN, Zvyagina EA, Bobrikov AA (2015) Pileate macromycetes and their phytocenotic allocation in the Surgut and the surrounding area [Шляпочные грибы и их фитоценотическое распределение на территории города Сургута и его окрестностей]. Sovremennyye problemy nauki i obrazovaniya 6[In Russian].

- Makarova TA, Makarov PN, Alekhina LV (2011) Phytosanitary condition of Pine forests in the north of the Tyumen region [Фитосанитарное состояние сосняков на севере Тюменской области]. Vestnik Zashchity Rasteniy 3: 61-64. [In Russian].
- Makarova TA, Makarov PN (2016) Infectious agents of plants in stands in Surgut [Возбудители инфекционных болезней растений в насаждениях города Сургута]. Nauchnyy Al'manakh: Biologicheskiye Nauki 1-2 (15): 477-479. [In Russian].
- Malysheva EF (2018) Семейство Больбитиевые [Определитель грибов России. Порядок Агариковые]. [Definitorium fungorum Rossiae. Ardo Agaricales, fasc. 2, Familia Bolbitiaceae]. Nestor-Istoriya Spb, 416 pp. [In Russian].
- Mueller GM, Bills GF, Foster MS (2004) Biodiversity of fungi. Inventory and monitoring methods. Elsevier Academic Press
- Mukhin VA, Stepanova NT (1982) Aphyllophoroid fungi of Priobskaya forest tundra [Трутовые грибы Приобской лесотундры]. Mikologiya i Fitopatologiya 16 (1). [In Russian].
- Mukhin VA (1983) Consortia of woody plants at the polar limit of their distribution. Xylotrophic basidiomycetes [Консорции древесных растений на полярном пределе их распространения. Ксилотрофные базидиальные грибы]. Mikoriza i drugiye formy konsortivnykh svyazey v prirode. Perm, 61-63 pp. [In Russian].
- Mukhin VA, Olshvang VN (1983) Decomposition of wood in the floodplain forests of Yamal [Разложение древесины в пойменных лесах Ямала]. Ekologiya/Экология 1: 44-48. [In Russian].
- Mukhin VA, Stepanova NT (1983) The role of Corticioid fungi in the decomposition of wood in Yamal [Роль кортициевых грибов в разложении древесины на Ямале]. Mikologiya i Fitopatologiya 17 (4): 345-348. [In Russian].
- Mukhin VA (1984) Xylotrophic basidiomycetes of the Priobskaya forest-tundra: ecological and floristic essay [Ксилотрофные базидиальные грибы приобской лесотундры: эколого-флористический очерк]. UNTS AN SSSR, Sverdlovsk, 84 pp. [In Russian].
- Mukhin VA (1987a) Active core of the subarctic flora of xylotrophic basidiomycetes of Western Siberia [Активное ядро субарктической флоры ксилотрофных базидиомицетов Западной Сибири]. Mikologiya i Fitopatologiya 21 (3): 195-199. [In Russian].
- Mukhin VA (1987b) Flora of xylotrophic basidiomycetes of the pre-tundra forests of the Northern Priobye [Флора ксилотрофных базидиальных грибов предлесотундровых редколесий Северного Приобья]. Mikologiya i Fitopatologiya 21 (2). [In Russian].
- Mukhin VA (1991) Xylotrophic basidiomycetes of the shrub tundra of the Yamal [Ксилотрофные базидиомицеты кустарниковых тундр Ямала]. Mikologiya i Fitopatologiya 25 (5): 394-397. [In Russian].
- Mukhin VA (1993) Boita of lignicolous basidiomycetes of West Siberian plain [Биота ксилотрофных базидиомицетов Западно-Сибирской равнины]. UIF Nauka, Ekaterinburg. [In Russian].
- Nezdoiminogo EL (1996) Семейство Паутинниковые [Определитель грибов России: Порядок агариковые]. [Definitorium fungorum Rossiae, Ordo Agaricales, Familia Cortinariaceae]. Nauka, 407 pp. [In Russian]. [ISBN 5-02-026035-5 978-5-02-026035-1]
- Nezdojminogo EL (2001) Basidial macromycetes in mountain tundras of Polar Urals. Mikologiya i Fitopatologiya 35 (2): 26-29. [In Russian].

- Paukov AG, Mikhaylova AN (2011) Lichens of "Samarovskiy Chugas" Nature Park (Tyumen region) [Лишайники природного парка "Самаровский Чугас" (Тюменская область)]. Novosti Sistematiki Nizshikh Rasteniy 45: 204-214. [In Russian].
- Pristyazhnyuk SA (1994) Lichens of the middle course of the Sabayakha River [Лишайники среднего течения реки Сэбаяха (Западный Ямал)]. Botanicheskiy Zhurnal 79 (11). [In Russian].
- Pristyazhnyuk SA (1996) Restoration of shrub-moss-lichen sand-blowing communities in the Yamal tundra [Восстановление кустарничково-мохово-лишайниковых сообществ на песчаных раздувах в Ямальских тундрах]. III mezhd. konf. Osvoyeniye Severa i problemy rekul'tivatsii. Tez. dokl. Syktyvkar, Syktyvkar, 163-165 pp. [In Russian].
- Pristyazhnyuk SA (1998) Lichens of the southern subarctic tundra of the Yamal Peninsula and overgrazing [Лишайники южных субарктических тундр Ямала и перевыпас]. Sibirskiy Ekologicheskiy Zhurnal 5 (2): 197-200. [In Russian].
- Pristyazhnyuk SA (2001) Synusia of ground lichens of the subarctic tundra of the Yamal Peninsula [Синузии напочвенных лишайников субарктических тундр полуострова Ямал]. Botanicheskiy Zhurnal 86 (5): 30-38. [In Russian].
- Raytviyr AG, Sirko AV (1968) New and interesting discourses from the Polar Urals [Новые и интересные дискомицеты с Полярного Урала]. Izdatel'stvo Akademii Nauk EstSSR 3: 325-330. [In Russian].
- Ryabkova KA (1998) Systematic checklist of lichens of Ural mountains [Систематический список лишайников Урала]. Novosti Sistematiki Nizshikh Rasteniy 32: 81-87. [In Russian].
- Ryabkova NY (1965) On the history of lichen flora of the Urals [К истории лихенофлоры Урала]. Uch. zap. Sverdlovskogo gos. ped. instituta Botanika 29: 63-70. [In Russian].
- Ryabkova NY, Vasina AL, Chernova OP (1996) Additions to flora of lichens of the Malaya Sos'va nature reserve [К флоре лишайников заповедника «Малая Сосьва» (Зауралье)]. Problemy zapovednogo dela. 25 let Visimskomu zapovedniku. (Mat-ly nauch. konf.). Tez. dokl. Izd-vo «Yekaterinburg», Ekaterinburg, 187-188 pp. [In Russian].
- Sedelnikova NV, Taran GS (2000) The main characteristics of the lichenoflora of the Elizarovskiy zakaznik (lower Ob River) [Основные черты лихенофлоры Елизаровского заказника]. Krylovia 2 (1): 46-53. [In Russian].
- Sedelnikova NV (2010) Species diversity of lichens in the designed "Manyinsky" Natural park and the basin of the Malaya Sos'va river (Subpolar and North Urals, Khanty-Mansi autonomous okrug - Yugra) [Видовое разнообразие лишайников проектируемого природного парка «Маньинский» и бассейна Р. Малая Сосьва (приполярный и северный урал, Ханты-Мансийский автономный округ Югра)]. Vestnik ekologii, lesovedeniya i landshaftovedeniya 11: 3-36. [In Russian].
- Sedelnikova NV (2017) The species diversity of lichen biota in Western Siberia and the assessment of the role of lichen species in its main mountain and plain phytocenoses [Видовое разнообразие лихенобиоты Западной Сибири и оценка участия видов лишайников в основных ее горных и равнинных фитоценозах]. Akademičeskoe izd-vo "Geo", Novosibirsk, 611 pp. [In Russian].

- Shalatonov EN (2010) Supplements to the floristic list of the bogs in the "Noomto" natural park [Дополнения к списку флоры болот природного парка «Нумто»]. Vestnik Ekologii, Lesovedeniya i Landshaftovedeniya 10: 62-67. [In Russian].
- Shiryaev A (2006) Clavarioid fungi of Urals: III. Arctic zone. Mikologiya i Fitopatologiya 40 (4): 294-307.
- Shiryaev A, Moiseev P, Peintner U, Devi N, Kukarskih V, Elsakov V (2019) Arctic Greening Caused by Warming Contributes to Compositional Changes of Mycobiota at the Polar Urals. Forests 10 (12). https://doi.org/10.3390/f10121112
- Shiryaev AG (2002) Clavarioid basidiomycetes of the "Sibirskie Uvaly" natural park [Клавариоидные базидиомицеты (Clavariaceae s.l.) заповедно-природного парка “Сибирские Увалы”]. Ekologicheskiye issledovaniya vostochnoy chasti Sibirskikh Uvalov: sb. nauch. tr. Zapoved.- prirod. Parka "Sibirskiye Uvaly". Nizhnevartovsk: Izd-vo "Priob'ye" 69-79. [In Russian].
- Shiryaev AG (2004) Clavarioid fungi of Urals. I. Boreal forest zone. Mikologiya i Fitopatologiya 38 (4): 59-72.
- Shiryaev AG (2009) Changes in the mycobiota of the Ural-and-Siberian region under global warming and anthropogenic impact [Изменения микобиоты Урало-Сибирского региона в условиях глобального потепления и антропогенного воздействия]. Vestnik ekologii, lesovedeniya i landshaftovedeniya 9[In Russian].
- Shiryaev AG (2011) A spatial structure of Arctic complexes of Clavarioid fungi [Пространственная структура Арктических комплексов клавариоидных грибов]. Vestnik Ekologii, Lesovedeniya i Landshaftovedeniya 11: 39-49. [In Russian].
- Shiryaev AG (2013) Spatial heterogeneity of the species composition of a clavarioid fungi’s compex in the Eurasian Arctic. Contemporary Problems of Ecology 6 (4): 381-389. https://doi.org/10.1134/s1995425513040112
- Shiryaev AG, Ravkin YS, Yefimov VM, Bogomolova IN, Tsybulin SM (2016) Spatial-typological differentiation of clavarioid mycobiota in Northern Eurasia. Contemporary Problems of Ecology 9 (5): 535-543. https://doi.org/10.1134/s1995425516050140
- Shiryaev AG (2017) Longitudinal changes of clavarioid funga (Basidiomycota) diversity in the tundra zone of Eurasia. Mycology 8 (3): 135-146. https://doi.org/10.1080/21501203.2017.1345801
- Shiryaev AG (2018) Spatial diversity of clavarioid mycota (Basidiomycota) at the forest-tundra ecotone. Mycoscience 59 (4): 310-318.
- Shishkonakova EA, Abramova LI, Avetov NA, Tolpysheva TY, Shvedchikova NK (2013) Bogs of the former Ai-Nadymtiylor lake bottom (Nature Park Numto, KHMAO-Yugra) [Болота котловины Ай-Надымтыйлор (природный парк Нумто, Ханты-Мансийский автономный округ-Югра)]. Byulletin Moskovskogo Obshestva Ispytateley Prirody, Otdelenie Biologii 118 (248): 48-56. [In In Russian].
- Shishkonakova EA, Avetov NA, Berezina NA, Tolpysheva TY, Shvedchikova NK (2016) Regressive processes in the bogs of the southern part of Nature Park Numto (Khanty-Mansiysk autonomous okrug- Yugra) [Проявление регрессивных процессов на болотах южной части природного парка «Нумто» (Ханты-Мансийский автономный округ-Югра)]. Bulletin Moskovskogo Obshestva Ispytateley Prirody, Otdelenie Biologii 3: 39-50. [In Russian].
- Shishkonakova EA, Tolpysheva TY (2018) The development of lichens in reclaimed oil sludge barns (Khanty-Mansi Autonomous Okrug-Yugra) [Развитие лишайников на рекультивируемых нефтешламовых амбарах (ХМАО-Югра)]. Problemy lesnoy

fitopatologii. Materialy KH Mezhdunarodnoy konferentsii. Moskva-Petrozavodsk, 15-19 oktyabrya 2018 231-234. [In Russian].

- Sirko AV (1970a) New data on the flora of Ascomycota of the Urals and adjacent plains [Новые данные о флоре сумчатых грибов Урала и прилегающих равнин]. Ekologiya rasteniy i geobotanika: materialy otchet. ses. Instituta Ekologii rasteniy i zhivotnykh za 1968 g. UFAN SSSR, Sverdlovsk, 61-67 pp. [In Russian].
- Sirko AV (1970b) The genus *Scutellinua* (Cooke) Lamb in the Urals [Род *Scutellinia* (cooke) Lamb на Урале]. 1. Sverdlovaskaya konferentsiya molodykh nauchnykh rabotnikov po sel'skomu khozyaystvu: tez. dok. [In Russian].
- Sirko AV (1971) Ascomycota of the Urals and patterns of their distribution: PhD thesis [Сумчатые грибы Урала и закономерности их распространения : автореф. дис. канд. биол. наук]. Sverdlovsk, Sverdlovsk, 27 pp. [In Russian].
- Stavishenko IV (1996) Species diversity monitoring of the communities of lignicolous fungi in Nature Reserve «Yuganskiy» [Мониторинг видового разнообразия сообщества ксилотрофных грибов заповедника "Юганский"]. Problemy obshchey i prikladnoy ekologii: materialy molodezh. konf. 241-249. [In Russian].
- Stavishenko IV (1997) Criteria of evaluation of rare species of lignicolous macromycetes in middle taiga zone of Priobye [Критерии выделения редких видов ксилотрофных макромицетов среднетаежного Приобья]. Problemy regional'noy Krasnoy knigi. Perm, 34-36 pp. [In Russian].
- Stavishenko IV (2000) Xylotrophous macromycetes of Yugan strict Nature Reserve [Ксилотрофные макромицеты Юганского заповедника]. Mikologiya i Fitopatologiya 34 (1): 23-29. [In Russian].
- Stavishenko IV, Mukhin VA (2002) Xylotrophic macromycetes of the Yuganskiy nature reserve [Ксилотрофные макромицеты Юганского заповедника]. Izdatel'stvo "Yekaterinburg", Yekaterinburg. [In Russian].
- Stavishenko IV (2003) Wood-decaying fungi from the south part of "Siberian Uvaly" park territory [Ксилотрофные макромицеты южной части территории Заповедно-природного парка "Сибирские Увалы"]. Ecological studies of the eastern part of Siberian Uvalov: Sat scientific tr Commandment. nature. Park "Siberian Uvaly". 2. [In Russian].
- Stavishenko IV (2007a) Aphyllophoroid fungi of the natural park "Kondinskyie lakes" (West Siberia) [Афиллофороидные грибы природного парка “Кондинские озера” (Зап. Сибирь)]. Mikologiya i Fitopatologiya 41 (2): 152-163. [In Russian].
- Stavishenko IV (2007b) The materials on species diversity of Aphyllophoroid fungi from natural reserve "Malaya Sosva" [Материалы к видовому разнообразию афиллофороидных грибов заповедника “Малая Сосьва”]. Biologicheskiye Resursy i Prirodopol'zovaniye 10: 116-127. [In Russian].
- Stavishenko IV (2008) Monitoring of wood-rotting fungi community of the natural park "Kondinskie Ozyera" (the Konda Lakes) [Мониторинг сообществ дереворазрушающих грибов природного парка "Кондинские озера"]. Sibirskiy Ekologicheskiy Zhurnal 15 (4): 645-654. [In Russian].
- Stavishenko IV, Zalesov SV (2008) Flora and fauna of the Samarovskiy Chugas nature park: xylotrophic basidiomycetes [Флора и фауна природного парка "Самаровский чугас". Ксилотрофные базидиальные грибы]. Uralskiy gosudarstvennyy Lesotekhnicheskiy universitet, Ekaterinburg, 104 pp. [In Russian].

- Stavishenko IV (2011) Aphyllophoraceous fungi of the nature reserve «Malaya Sosva» (Western Siberia) [Афиллофоровые грибы заповедника «Малая Сосьва» (западная сибирь)]. Mikologiya i Fitopatologiya 45 (2): 142-157. [In Russian].
- Stepanova-Kartavenko NT (1967) Aphyllophoroid fungi of the Urals [Афиллофоровые грибы Урала]. Ural'skiy rabochiy, Sverdlovsk, 294 pp. [In Russian].
- Stepanova NT (1970) To the flora of Ascomycota and Fungi Imperfecti of the Urals [К флоре сумчатых и несовершенных грибов Урала]. Sporovyye rasteniya Urala: materialy po izucheniyu flory i rastitel'nosti Urala. 4. UFAN SSSR, Sverdlovsk, 3-52 pp. [In Russian].
- Stepanova NT, Sirko AV (1970) About mycoflora of the Polar Urals [О микофлоре Полярного Урала]. Mikoloiya i Fitopatologiya 4 (5): 409-412. [In Russian].
- Tarchevskaya OB (1985a) Agaricoid fungi in the subzone of the southern tundras of the Yamal [Агариковые грибы в подзоне южных тундр Ямала]. Botanicheskiye issledovaniya na Urale (informatsionnyye materialy). UNTS AN SSSR, Sverdlovsk, 12 pp. [In Russian].
- Tarchevskaya OB (1985b) Assessment of the biogeocenotic significance of fungi in the subzone of the southern tundra of the Yamal [Оценка биогеоценотической значимости грибов в подзоне южных тундр Ямала]. Problemy ekologicheskogo monitoringa i nauchnyye osnovy okhrany prirody na Urale (informatsionnyye materialy). UNTS AN SSSR, Sverdlovsk, 53-54 pp. [In Russian].
- Tarchevskaya OB (1986) The yield of edible mushrooms in the southern shrub tundra [Урожайность съедобных грибов в южных кустарниковых тундрах]. Botanicheskiye issledovaniya na Urale (inform. materialy). 16 pp. [In Russian].
- Tarchevskaya OB (1990) Agaciroid fungi flora of Southern Yamal [Флора шляпочных грибов Южного Ямала]. Ekologo-floristicheskiye issledovaniya po sporovym rasteniyam Urala. UrO AN SSSR, Sverdlovsk, 79-86 pp. [In Russian].
- Tolpysheva TY (2004) The community structure of epiphytic lichens of raised bogs in the Middle Ob river [Элементы структуры сообществ эпифитных лишайников олиготрофных болот Среднего Приобья (Западная Сибирь)]. Vestnik Moskovskogo universiteta. Ser. 16, Biologiya 42-46. [In Russian].
- Tolpysheva TY (2006) Cladonia as regulators of soil micromycetes in raised bogs of the West Siberian plain [Кладонии как регуляторы почвенных микромицетов на олиготрофных болотах Западно-Сибирской равнины]. In: МГУ (Ed.) Griby i vodorosli v biogeotsenozakh - 2006. Material. mezhdunar. konf., posvyashch. 75-letiyu biol. f-ta MGU im. M.V. Lomonosova, 31 yanv.-3 fevr, 2006. 198-199 pp. [In Russian].
- Tolpysheva TY, Shishkonakova EA (2019) Lichens species composition in the south part of the region park Numto (KHMAO-Yugra, West Siberia) [Лишайники южной части парка Нумто (ХМАО-Югра, Западная Сибирь)]. Rastitel'nyy Mir Aziatskoy Rossii 1 (33): 15-22. [In Russian].
- Tolpysheva TY, Shishkonakova EA (2020) Lichens species composition of sludge pits (Khanty-Mansiysk autonomous okrug- Yugra, West Siberia) [Лишайники рекультивируемых нефтешламовых амбаров (Ханты-Мансийский автономный округ-Югра, Западная Сибирь)]. Rastitel'nyy Mir Aziatskoy Rossii 13 (7): 6-10. [In Russian].
- Trapeznikova SN (2003) Materials to flora of lichens from the "Siberian Uvaly" Park [Материалы к флоре лишайников Заповедно-Природного парка "Сибирские Увалы"]. Ekologicheskiye issledovaniya vostochnoy chasti Sibirskikh Uvalov: sb. nauch.

tr. Zapoved.- prirod. Parka «Sibirskiye Uvaly». Nizhnevartovsk: Izd-vo "Priob'ye" 2: 36-42. [In Russian].

- Vlasenko A, Filippova N, Vlasenko V (2019) *Echinostelium microsporum* (Echinosteliaceae, Myxomycetes), a new epiphytic corticolous species from Russia. Phytotaxa 416 (1): 67-72. https://doi.org/10.11646/phytotaxa.416.1.8
- Vlasenko AV, Filippova NV, Vlasenko VA (2018) *Echinostelium novozhilovii* (Echinosteliaceae, Myxomycetes), a new species from Northern Asia. Phytotaxa 367 (1): 91-96. https://doi.org/10.11646/phytotaxa.367.1.11
- Zhurbenko MP (1999) Lichens of the Polar Urals in the valley of the river Sob [Лишайники Полярного Урала в долине р. Собь]. Novosti Sistematiki Nizshikh Rasteniy 33: 120-130. [In Russian].
- Zvyagina EA, Baykalova AS, Gorbunova IA (2007) Macromycetes of the reserve "Yuganskiy" [Макромицеты заповедника «Юганский»]. Mikologia i Fitopatologiya 41 (1): 29-40. [In Russian].
- Zvyagina EA, Baykalova AS, Kondrashov AS, Jeims TI (2009) The diversity of *Suillus* s.l. in the Yugansky nature reserve [Разнообразие грибов рода Suillus s.l. в заповеднике «Юганский»]. Ekologiya i prirodopol'zovaniye v Yugre. Materialy nauchno-prakticheskoy konferentsii. Surgut, 2009 34-35. [In Russian].
- Zvyagina EA (2012) New records of rare and endangered macromycetes in Khanty-Mansiysk region [Новые находки редких и охраняемых видов макромицетов в Ханты-Мансийском округе]. Environmental Dynamics and Global Climate Change 3[In Russian].
- Zvyagina EA (2015) On the biology and ecology of *Sarcosoma globosum* in the middle taiga belt of West Siberia [К биологии и экологии Sarcosoma globosum в условиях средней тайги Западной Сибири]. Environmental Dynamics and Global Climate Change 6: 3-11. [In Russian].
- Zvyagina EA, Vasina AL (2015) New data on macromycetes of the "Malaya sosva" nature reserve (Khanty-Mansi region) [Новые данные о макромицетах заповедника "Малая сосьва" (Ханты-Мансийский автономный округ]. Mikologiya i Fitopatologiya 49 (6): 349-358. [In Russian].
- Zvyagina, E.A., Baykalova, A.S. (2017) New records to the fungal biodiversity list of the Yuganskiy Nature Reserve (Western Siberia) [Дополнение к списку макромицетов заповедника «Юганский» (Западная Сибирь)]. Environmental Dynamics and Global Climate Change 8 (1): 25-42. [In Russian]. https://doi.org/10.17816/edgcc8125-42

Supplementary materials

Suppl. material 1: The digitization database doi

Authors: Filippova, N.V.
Data type: Bibliography
Brief description: To track the digitisation process, a working database was created. Each bibliographic record has a series of fields to describe the digitisation process and its results: the total number of extracted occurrence records, general description of the occurrence quality, presence of observation date, presence of specimen number and details of georeferencing.
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Suppl. material 2: The bibliography of mycological research in the Northern West Siberia doi

Authors: Filippova, N.V.
Data type: Bibliography
Brief description: The bibliography presents all scientific publications (journal papers, conference proceedings, PhD theseses, monographs and book chapters). The bibliography of publications was formatted according to the rules of Scopus: transliteration and translation of all Russian-language sources was made for the convenience of a foreign reader and standardisation of citations in English-language publications.
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